In silico study of osmotic stress responsive genomic elements with special reference to CKIN/SnRK genes and bZIPS TFsfamily in Pigeon pea (Cajanuscajan L.)

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Abstract

Pigeon pea is a leguminous crop commonly grown in India, and is primarily cultivated in tropical regions. Although it is often overlooked, this crop has immense potential for improvement in both quantity and quality of production in India. Among all the legumes grown in the region, pigeon pea stands out for its unique combination of optimal nutritional profiles, high tolerance to environmental stress, high biomass productivity, and its ability to contribute essential nutrients and moisture to the soil. Pigeon pea is a rich source of starch, protein, calcium, manganese, crude fiber, fat, trace elements, and minerals Moreover, apart from its high nutritional value, pigeon pea is also used in traditional folk medicine in India, China, Philippines, and other countries (Sharma et al 2011) Proper nutrition is a critical foundational requirement, as it has a significant impact on health, work performance, and cognitive development However, in many developing nations, there is a growing prevalence of hunger and malnutrition (FAO, 1980) Pigeon pea, a type of legume belonging to the Leguminosae family, is particularly prevalent in India, where it is widely grown and consumed. Pigeon pea is also known by vanous other names such as red gram, arhar, and tur dal, as highlighted by (Ghadge et al. 2008). For a long time, pigeon pea was believed to be one of only two species in the Cajanus DC genus. However, further research has shown that this genus is now considered to be part of a larger group of related genera, including Atylosia, Endomallus, Rhynchosia, and Dunbaria. As a result, the Cajanus genus has expanded to include a total of 32 distinct species. It is a leguminous shrub that can grow up to 5 meters in height. It likely originated in South Asia and first appeared in West Africa around 2000 BC, which is now recognized as a second major center of origin. Pigeon pea was brought to the West Indies through the slave trade, where it gained the nickname "pigeon pea" due to its use as bird feed in 1692, according to (Van der Maesen's 1985). The plant's leaves are arranged spirally on the stem and consist of three leaflets Flowers are typically yellow and grow in terminal or axillary racemes, measuring 2-3 cm in length. Although pigeon pea pods are usually green, they can be hairy, streaked, or even colored dark purple, and contain 2-9 seeds per pod, which can vary widely in color and weight between 4-25g/100 seeds (Sheldrake, 1984). While the most common use for pigeon pea is in the form of dry split seeds (dhal), the pods and seeds are also harvested and consumed as a green vegetable in many countries. Pigeonpea is a crucial legume food crop that has been cultivated for more than 3.500 years in india It is grown on approximately 5 million hectares and is the sixth most significant legume food crop globally (Mula et al 2010). This crop is a vital protein source for more than a billion people in the developing world and supports the livelihoods of millions of resource poor farmers, across Asia, Africa, South Amenca, Central America, and the the Canbbean (Royes et al Longmans, London and New York, 1976). The challenge of protein deficiency in the developing world, where protein is often available at levels less than one-third of the minimum dietary requirements, is likely to worsen due to the increasing human population and stagnation in crop yields. Legumes, such as pigeonpea, provide a highly nutritious and balanced source of calories and protein that is not provided by commonly grown cereals in semi arid regions, making them for food security (Varshney et al 2012) Major efforts are underway worldwide to increase Pigeon pea production by genetic analysis of t the key traits, and then utilizing the genomic resources which can accelerate progress. Increased population coupled with consumption preferences has resulted in a substantial increase in the demand for Pigeon pea. However, there is an urgent need to increase the yield and productivity to feed the burgeoning world population along with increased tolerance against various biotic and abiotic stresses limiting wheat production by sagrificantly decreasing crop yield (Joshi 2017). Osmotic stress is however a major challenge for wheat et al production as it causes devastating effects on crop yield d. Therefore, finding ways to improve crop tolerance to osmotic stresses is essential to improve Pigeon pea productivity to achieve food security